CLAIMS

What is claimed is:

1. A method for producing a control output, comprising:

identifying an error signal;

decomposing the error signal into a plurality of signal components, a sum of the plurality of signal components being equal to the error signal, the plurality of signal components being determined based on a plurality of orthogonal functions representing multi-resolution decomposition properties;

transforming each signal component; and

summing the transformed signal components to determine a control signal.

2. The method of claim 1, wherein the plurality of orthogonal functions include at least one function describing wavelets.

3. The method of claim 1, wherein transforming includes differentiation of at least one signal component.

4. The method of claim 1, wherein transforming includes integration of at least one signal component.

5. The method of claim 1, wherein transforming includes scaling of at least one signal component.

6. The method of claim 1, wherein transforming includes applying a linear function to at least one signal component.

7. The method of claim 1, wherein transforming includes applying a non-linear function to at least one signal component.

8. The method of claim 1, wherein the control signal is determined in real time.

9. The method of claim 1, wherein one of the signal components is the differential of the error signal using Daubechies wavelets.

10. The method of claim 1, wherein identifying an error signal includes receiving the error signal.

11. The method of claim 1, wherein the plurality of transformed signal components includes each of a low, intermediate and high scale component.

12. The method of claim 1, wherein the control signal may be represented as:

$$u = K_H * f_H(e_H) + K_{M_1} * f_{M_1}(e_{M_1}) + \ldots + K_{M_{N-1}} * f_{M_{N-1}}(e_{M_{N-1}}) + K_L * f_L(e_L)$$

13. The method of claim 12, wherein each function $f_i(.)$ can be a linear or a non-linear function.

14. The method of claim 12, wherein each signal component is a function of time and frequency.

15. The method of claim 12, wherein the plurality of signal components includes (de/dt)Kd, and Kp.

16. The method of claim 15, wherein summing the scaled signal components includes summing only (de/dt)Kd, and Kp to emulate a PD controller output.

17. The method of claim 12, wherein the plurality of transformed signal components includes (de/dt)Kd, (1/s)Ki, and Kp.

18. The method of claim 17, wherein summing the transformed signal components includes summing (de/dt)Kd, (1/s)Ki and Kp to emulate a PID controller output.

19. A system for producing a control output, comprising:

means for identifying an error signal;

means for decomposing the error signal into a plurality of signal components, a sum of the plurality of signal components being equal to the error signal, the plurality of signal

components being determined based on a plurality of orthogonal functions representing multi-resolution decomposition properties;

means for transforming each signal component; and

means for summing the transformed signal components to determine a control signal.

20. The system of claim 19, wherein the means for decomposing the error signal into a plurality of signal components employs at least one function describing wavelets.

21. The system of claim 19, wherein the means for transforming includes means for differentiating at least one signal component.

22. The system of claim 19, wherein the means for transforming includes means for integrating at least one signal component.

23. The system of claim 19, wherein the means for transforming includes means for scaling at least one signal component.

24. The system of claim 19, wherein the means for transforming includes means for applying a linear function to at least one signal component.

25. The system of claim 19, wherein the means for transforming includes means for applying a nonlinear function to at least one signal component.

26. The system of claim 19, wherein the means for decomposing produces the differential of the error signal using Daubechies wavelets.

27. The system of claim 19, wherein the means for identifying an error signal includes means for receiving the error signal.

28. The system of claim 19, wherein the means for transforming produces each of a low, intermediate and high scale component.

29. The system of claim 19, wherein the control signal may be represented as:

$$u = K_H * f_H(e_H) + K_{M_1} * f_{M_1}(e_{M_1}) + \ldots + K_{M_{N-1}} * f_{M_{N-1}}(e_{M_{N-1}}) + K_L * f_L(e_L)$$

30. The system of claim 29, wherein each function $f_i(.)$ can be a linear or a non-linear function.

31. The system of claim 29, wherein the means for decomposing produces a plurality of signal components including (de/dt)Kd, and Kp.

32. The system of claim 31, wherein means for transforming produces (de/dt)Kd, and Kp to emulate a PD controller output.

33. The system of claim 29, wherein the means for transforming signal components produces (de/dt)Kd, (1/s)Ki, and Kp.

34. The system of claim 33, wherein the means for summing sums (de/dt)Kd, (1/s)Ki and Kp to emulate a PID controller output.

35. An apparatus for producing a control output, comprising:

a processor; and

a memory operatively connected to the processor, said memory storing control logic for directing the processor to:

identify an error signal;

decompose the error signal into a plurality of signal components, a sum of the plurality of signal components being equal to the error signal, the plurality of signal components being determined based on a plurality of orthogonal functions representing multi-resolution decomposition properties;

transform each signal component; and

sum the transformed signal components to determine a control signal.

36. A computer-readable storage medium encoded with processing instructions for producing a control output, the processing instructions for directing a computer to perform the steps of:

identifying an error signal;

decomposing the error signal into a plurality of signal components, a sum of the plurality of signal components being equal to the error signal, the plurality of signal components being determined based on a plurality of orthogonal functions representing multi-resolution decomposition properties;

transforming each signal component; and

summing the transformed signal components to determine a control signal.